# DEPARTMENTS.

## SOLUTIONS OF PROBLEMS.

### ALGEBRA.

**340. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.**

Let $S_{n-1}=1^{n-1}+2^{n-1}+3^{n-1}+\ldots+(n-1)^{n-1}$. Find $n$ if $S_{n-1}-(n-1)$ is a multiple of $n^2$.

No complete solution of this problem has been received.

**341. Proposed by O. L. CALLICOTT, Gettysburg, South Dakota.**

Prove that the sum of the series, $\frac{1}{1.2}+\frac{1}{3.4}+\frac{1}{5.6}+\ldots$ to infinity $=$ the sum of the series $\frac{1}{2}.1+\frac{1}{2^2}.\frac{1}{2}+\frac{1}{2^3}.\frac{1}{3}+\frac{1}{2^4}.\frac{1}{4}+\ldots$ to infinity.

**Solution by J. SCHEFFER, A. M., Hagerstown, Md.**

$$\frac{1}{(n+1)\ (n+2)}\equiv\frac{1}{n+1}-\frac{1}{n+2}.$$

Hence, by substituting for $n$, 0, 1, 2, 3, ...., and adding, we have

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots.=\frac{1}{1}-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\ldots.=\log 2.$$

Now $-\log(1-x)=x+\frac{x^2}{2}+\frac{x^3}{3}+\ldots$, which for $x=\frac{1}{2}$, becomes

$$-\log(\tfrac{1}{2})=\log 2=\tfrac{1}{2}+\tfrac{1}{2}(\tfrac{1}{2})^2+\tfrac{1}{3}(\tfrac{1}{2})^3+\ldots$$

This proves the proposition.

Also solved by V. M. Spunar.

### GEOMETRY.

**367. Proposed by W. J. GREENSTREET, M. A., Stroud, England.**

The tangents from a point $A$ to a circle are bisected by a line $XYZ$, which cuts a chord in $X$ and the tangents at its extremities in $Y$, $Z$. Show that $XAY=XAZ$, or $XAY=\pi-XAZ$. Also, reciprocate with respect to $A$.